Drinking Water Surveillance Program

THAMESVILLE WATER SUPPLY SYSTEM

Annual Report 1988

Ontario Environment Environnement
Jim Bradley, Minister/ministre

ISSN 0843-8374

91-02669/

THAMESVILLE
WATER SUPPLY SYSTEM

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT 1988

FEBRUARY 1990

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

THAMESVILLE WATER SUPPLY
1988 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 52 plants are being monitored.

The Thamesville Water Supply uses a groundwater source. The raw water is pumped through a Manganese Green Sand Filter for iron and manganese removal, the only additional treatment process applied is chlorination. This supply has a design capaicity of 1.31 x 1000 m^3/day and serves a population of approximately 900.

Water samples of the raw and treated water and one site in the distribution system were taken on a monthly basis beginning in February, 1988. The Thamesville Water Supply was sampled, for approximately 160 parameters. Parameters were divided into the following groups: Bacteriological, Inorganic and Physical (Laboratory Chemistry, Field Chemistry and Metals) and Organic (Chloroaromatics, Chlorophenols, Pesticides and PCB, Phenolics, Polynuclear Aromatic Hydrocarbons, Specific Pesticides and Volatiles). Chlorophenols and Specific Pesticides were analysed for in June and November only.

A summary of results is shown in Table 1.

Inorganic and Physical parameters were below any applicable health related ODWOs.

Of a total of approximately 110 Organic parameters tested on a monthly basis, none exceeded health related guidelines.

During 1988 the DWSP sampling results indicated that the Thamesville Water Supply System produced good quality water.

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY

SUMMARY TABLE BY SCAN

SCAN	RAW			TREATED			SITE 1		
	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE	TESTS	POSITIVE	%POSITIVE
BACTERIOLOGICAL	30	3	10	33	2	6	33	7	21
CHEMISTRY (FLD)	22	22	100	55	55	100	57	57	100
CHEMISTRY (LAB)	225	182	80	226	165	73	397	332	83
METALS	263	103	39	264	111	42	517	250	48
CHLOROAROMATICS	154	0	0	154	0	0	154	0	0
CHLOROPHENOLS	12	0	0	6	0	0	.	.	.
PAH	187	0	0	187	0	0	.	.	.
PESTICIDES & PCB	364	0	0	353	0	0	353	0	0
PHENOLICS	11	3	27	11	1	9	.	.	.
SPECIFIC PESTICIDES	57	0	0	51	0	0	1	0	0
VOLATILES	288	1	0	288	37	12	288	37	12
TOTAL	1613	314		1628	371		1800	683	

NO HEALTH RELATED GUIDELINES WERE EXCEEDED

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

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INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 52 plants are being monitored. Appendix A contains a detailed description of the DWSP.

The DWSP was initiated in Thamesville in February of 1988. This report contains information and results for 1988.

PLANT DESCRIPTION

The Thamesville Water Supply is a groundwater source. The raw water is pumped from the well through a Manganese Green Sand Filter, for iron and manganese removal, into a water tower. The water is chlorinated after the filter. The Thamesville Water Supply has a design capacity of 1.31 x 1000 m^3/day and flows on day of sampling ranging from 0.2 x 1000 m^3/day to 0.7 x 1000 m^3/day. A population of approximately 900 is served.

The location is shown in Figure 1. General information is presented in Table 2.

METHODS

Water samples were obtained from three DWSP approved locations;

i) Raw - The water originated from the discharge line of the well pump prior to chlorination and was sampled through a stainless steel line. The sample tap is located after the pump.

ii) Treated - The water originated from the discharge line and was sampled through a stainless steel line. The sample tap is located after the filters.

iii) Site 1 - This site is located approximately 1 kilometer from the plant. Water was sampled through steel piping from the basement laundry tap.

All sample lines were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in the same manner (APPENDIX B).

FIGURE 1

DRINKING WATER SURVEILLANCE PROGRAM

SITE LOCATION MAP

THAMESVILLE WATER SUPPLY SYSTEM

TABLE 2

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

GENERAL INFORMATION

THAMESVILLE WATER SUPPLY

LOCATION:	THAMESVILLE, ONTARIO PO BOX 220, HWY 21 N0P 2K0 (519-692-5377)
SOURCE:	RAW WATER SOURCE - GROUND WATER
RATED CAPACITY:	0.364 (1000 M3/DAY)
OPERATION:	MINISTRY
PLANT SUPERINTENDENT:	J. WILSON
MINISTRY REGION:	SOUTHWEST
MOE CONTACT:	J. DRUMMOND

MUNICIPALITY SERVED	POPULATION
THAMESVILLE	900

At distribution system locations two types of samples are obtained: a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples are used to make an assessment of the amount by which the levels of inorganic compounds and metals may be changed on standing due to leaching from (or deposition on) the plumbing system. The only analysis carried out on the standing samples therefore are General Chemistry and Metals. The free flow sample represented water from the distribution main that had been flowing at the sample tap for five minutes before being sampled.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. The retention time was calculated by dividing the volume of water between the two sampling points by the sample day flow. For example, if it was determined that the retention time within the plant was five hours then there would be a five hour interval between the raw and treated water sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water at the plant.

Sample day flow, treatment chemical dosages and field measurements such as Turbidity, Chlorine Residuals, pH and Temperature were

recorded on the day of sampling and were entered onto the DWSP data base as submitted.

RESULTS

The Thamesville Water Supply System locations were sampled for approximately 160 parameters on a monthly basis in 1988 beginning in February. The Specific Pesticides and Chlorophenols scans were sampled in June and November only. Polynuclear Aromatic Hydrocarbons and Phenols are only analysed in the raw and treated water. As a result of an unforeseen emergency the laboratory capacity was exceeded and analysis for volatiles could not be carried out when the samples were received. Since analysis for volatiles is no longer valid after four weeks of storage, volatile results for February are not available.

Table 3 contains information on the sample day retention time, flow rate and treatment chemicals used and their associated dosages.

Table 4 is a summary break-down of the number of water samples analysed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment (MOE) laboratory staff and is quantifiable. Trace (<T) denotes

that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analysed for in DWSP.

Associated guidelines and detection limits are also supplied on tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

General

Water quality is judged by comparison with the Ontario Drinking Water Objectives (ODWOs) as defined in the 1984 publication (ISBN 0-7743-8985-0). The Province of Ontario has health related and aesthetic objectives for 49 parameters, these are currently under review. When an ODWO is not available guidelines/limits from other agencies are consulted. The Parameters Listing System (PALIS) recently published (ISBN 0-7729-4461-X) by the MOE catalogues and keeps current over 1750 guidelines for 650 parameters from agencies throughout the world.

Although some of the parameters measured on DWSP may be present in the raw and treated water as a result of pollution, many of the compounds detected are naturally occuring or are treatment by-products.

The DWSP does not analyse for Taste and Odour or other biological water quality parameters, and can therefore not assess these aspects of the water supply.

As stated under Results, traces do not indicate quantifiable results as defined by established MOE laboratory analytical reporting protocols. While they can be useful in trend analysis or confirmation of the presence of a specific contaminant that is repeatedly detected at these levels, the occasional finding of a trace level of a contaminant is not considered to be significant. **DISCUSSION OF GUIDELINES AND LIMITS THEREFORE, IS ONLY CONDUCTED ON POSITIVE RESULTS.**

Bacteriology

Results for the Bacteriology scan indicate that there were nine positives in the treated and distribution water samples. In all cases, the positive parameters were Standard Plate Count or Total Coliform Background.

Standard Plate Count is a test used to supplement routine analysis

for Coliform bacteria. The limit for Standard Plate Count (at 35°C after 48 hours) in the ODWOs is 500 organisms per mL (based on a geometric mean of 5 or more samples). High Standard Plate Counts were present in the July and October Site 1 water samples. While no indicators of unsafe water were detected at this time, the high Standard Plate Count may be indicative of a deterioration in conditions in the distribution system. Total Chlorine Residual was not measured the Site 1 water samples for those months. No samples contained bacteriological results over any applicable health related ODWOs.

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality; the routine monitoring program usually requires the taking of multiple samples in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples. Routine bacteriological monitoring, as outlined in the ODWOs is carried out by the operating authority.

Inorganic and Physical

Laboratory and Field Chemistry

The results for the Laboratory Chemistry and Field Chemistry scans were below any applicable health related ODWOs.

Turbidity in water is caused by the presence of suspended matter

such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of Turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWO of 1 Formazin Turbidity Unit (FTU) is only applicable to treated water leaving the plant.

The hardness levels for the Thamesville water were all above 250 mg/L. The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters, provides an acceptable balance between corrosion and incrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Colour values exceeded the aesthetic ODWO of 5 True Colour Units (TCU) twice in the treated water and seven times in the Site 1 free flow water. Colour in drinking water may be due to the presence of natural or synthetic organic substances as well as certain metallic ions. High levels of iron were also present in some of the samples showing high colour.

It is desirable that the Temperature of drinking water be less than 15°C; the palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and

corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water. The desired ODWO was exceeded four times in the free flow distributed water during the summer months.

The Langelier Index is used extensively in estimating the corrosion potential of water. An increasingly negative index indicates the increasing possibility of corrosion. It is considered sound engineering practice to maintain a slightly positive Langelier Index. The Langelier Index for Thamesville is positive.

Metals

The results reported for the Metals scan were all below applicable health related ODWOs.

The aesthetic ODWO for IRON of 300 ug/L was exceeded six times in the Site 1 water with values ranging as high as 1500 ug/L, even though the treated water was uniformly well below the objective level.

The aesthetic ODWO for MANGANESE of 50 ug/L was exceeded in the May treated water sample at 52 ug/L and in the June Site 1 water sample at 81 ug/L.

The raw water at Thamesville contains iron and manganese levels well in excess of objective levels. Excessive levels of Iron and Manganese in drinking water are objectionable because they cause staining of laundry and may produce undesirable tastes in beverages. Excessive Iron can also promote the growth of iron bacteria in water mains and service pipes and Manganese may encourage the buildup of slimy coatings in piping which can slough off as black precipitates. The results indicate that the manganese green sand filter was successful in removing iron and manganese; in the case of iron however levels in the distribution system were greater than those in treated water at the plant; this also tended to be true for manganese in most samples. More detailed studies carried out by the Drinking Water Section's Technological Assessment Group on the Thamesville water have shown that organic fouling occurs in the distribution system. This results in biological growth in the pipeline and oxidation of the iron and manganese in the pipe.

Elevated levels of Copper, Lead, Iron, Manganese and Zinc were detected in the standing water as compared to the free flow water. This indicates that these metals were leached from the household plumbing or distribution mains as the water stood overnight. The distribution main to this site is made of cast iron. Although the Langelier Index indicates minimal potential for corrosion some metals will be leached in standing samples in most supplies.

Organic Parameters

Chloroaromatics

The results of the Chloroaromatics scan showed that one chloroaromatic was detected:

Hexachloroethane

Hexachloroethane was detected at a trace level, once in the treated water.

Chlorophenols

The results of the Chlorophenols scan showed that no chlorophenols were detected.

Pesticides and PCB (Polychlorinated Biphenyls)

The results of the Pesticides and PCB scan showed that no PCBs were detected and that one pesticide was detected:

Alpha-BHC

Alpha-BHC was detected at a trace level, once in the Site 1 water.

Specific Pesticides

Results of the Specific Pesticides scan showed that no Specific Pesticides were detected.

Phenolics

The maximum desirable concentration of phenolic substances in drinking water is 2.0 ug/L. This limit has been set primarily to prevent the occurrence of undesirable tastes and odours, particularly in chlorinated water. Phenolics were detected at 1.0 ug/L in the December raw water sample, 1.2 ug/L in the March and September raw water and 1.0 ug/L in the December treated water sample. Phenolics were detected at trace levels, three times in the raw water and six times in the treated water. Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes.

Polynuclear Aromatic Hydrocarbons (PAHs)

The results of the PAH scan showed that no PAHs were detected.

Volatiles

The results of the Volatiles scan showed that seven parameters, other than Trihalomethanes(THMs), were detected:

Benzene

Toluene

Ethylbenzene

Meta-Xylene

Ortho-Xylene

Styrene

Tetrachloroethylene

Benzene was detected at a trace level, once in a Site 1 water sample.

Toluene was detected at trace levels, twice in the raw water, three times in the treated water and four times in the Site 1 water samples. The detection of toluene at low, trace levels is a laboratory artifact derived from the analytical methodology. The purge-and-trap analytical technique depends on the purging of the volatile organics in the water sample with helium gas onto a Tenax trapping column. The volatile materials are subsequently thermally desorbed, separated and quantified. Tenax, a toluene-like polymeric material, tends to decompose sporadically upon heating into toluene and other aromatic componenets (ethylbenzene and xylene) giving instrument blanks in the order of 0.05 ug/L.

The detected trace levels of Styrene are also considered to be laboratory artifacts due to the outgassing of monomeric styrene from the polystyrene shipping containers. The sporadic background levels from this source are in the order of 0.05 ug/L.

Ethylbenzene was detected at trace levels, eight times in the raw water, six times in the treated water and six times in the Site 1 water samples.

Meta-Xylene (M-Xylene) was detected at trace levels, once in the

raw water, once in the treated water and three times in the Site 1 water samples.

Ortho-Xylene (O-Xylene) was detected at trace levels, twice in the treated water and four times in the Site 1 water samples.

These volatiles are typically found on an occasional basis at other water supplies included on the DWSP usually at trace levels.

Tetrachloroethylene (T-Chloroethylene) was detected was detected at a trace level, once in the Site 1 water sample.

THMs are acknowledged to be produced during the water treatment process and will always occur in chlorinated surface waters. THMs are comprised of Chloroform, Chlorodibromomethane and Dichlorobromomethane. Bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs.

Chloroform, Chlorodibromomethane and Dichlorobromomethane were detected in all treated water samples. Bromoform was not detected.

All Total THM occurrences, ranging from 53.9 ug/L to 129 ug/L, were well below the ODWO of 350 ug/L. No THMs were detected in the October treated water samples indicating no chlorination of that water. The plant reported that there was a chlorinator malfunction immediatelt prior to the DWSP sampling.

CONCLUSIONS

The Thamesville Water Supply for the sample year of 1988 was of good quality at the plant. The process of using the Manganese Green Sand Filter for iron and manganese removal appears to be initially effective; however, levels of iron and manganese increased during storage and distribution, perhaps due to the fact that the distribution main is cast iron and organic fouling occurs in the distribution system. The result is that the aesthetic objective levels for iron and manganese were exceeded at the consumers tap. The water delivered to the consumer is very hard and considered of poor quality from this aspect.

No health related guidelines, for organic or inorganic parameters, were exceeded during 1988.

RECOMMENDATIONS

One recommendation can be made:

1) Consideration should be given to design modification to ensure that the chlorine residual is maintained.

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY SAMPLE DAY CONDITIONS FOR 1988

	SAMPLE DAY CONDITIONS		TREATMENT CHEMICAL DOSAGES (MG/L)	
			FE,MN REMOVAL	POST-CHLORINATION
			POTASSIUM PERMANGANATE	CHLORINE
DATE	RETENTION TIME(HRS)	FLOW (1000M3)		
FEB 24	.2	.3	2.90	6.47
MAR 22	.2	.3	2.90	3.90
APR 19	.3	.3	2.90	3.90
MAY 17	.2	.2	2.90	3.90
JUN 21	.2	.4	2.60	3.90
JUL 19	.2	.4	2.40	3.90
AUG 16	.2	.7	2.55	3.90
SEP 20	.2	.3	2.40	3.90
OCT 18	.2	.3	2.40	3.90
NOV 15	.2	.4	2.40	4.20
DEC 13	.2	.2	2.40	3.90

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL	FECAL COLIFORM MF	9	0	0	.	.	.	.	.	.
	STANDRD PLATE CNT MF	3	3	0	6	1	0	6	6	0
	P/A BOTTLE	.	.	.	7	0	0	7	0	0
	TOTAL COLIFORM MF	9	0	0	10	0	0	10	0	0
	T COLIFORM BCKGRD MF	9	0	0	10	1	0	10	1	0
*TOTAL SCAN BACTERIOLOGICAL		30	3	0	33	2	0	33	7	0
*TOTAL GROUP BACTERIOLOGICAL		30	3	0	33	2	0	33	7	0
CHEMISTRY (FLD)	FLD CHLORINE (COMB)	.	.	.	11	11	0	4	4	0
	FLD CHLORINE FREE	.	.	.	11	11	0	4	4	0
	FLD CHLORINE (TOTAL)	.	.	.	11	11	0	5	5	0
	FLD PH	11	11	0	11	11	0	22	22	0
	FLD TEMPERATURE	11	11	0	11	11	0	22	22	0
*TOTAL SCAN CHEMISTRY (FLD)		22	22	0	55	55	0	57	57	0
CHEMISTRY (LAB)	ALKALINITY	11	11	0	11	11	0	22	22	0
	CALCIUM	11	11	0	11	11	0	22	22	0
	CYANIDE	10	0	0	11	0	0	11	0	0
	CHLORIDE	11	11	0	11	11	0	22	22	0
	COLOUR	11	11	0	11	10	1	22	21	1
	CONDUCTIVITY	11	11	0	11	11	0	22	22	0

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SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHEMISTRY (LAB)	FLUORIDE	11	11	0	11	11	0	22	22	0
	HARDNESS	11	11	0	11	11	0	22	22	0
	IONCAL	11	6	0	11	6	0	22	12	0
	LANGELIERS INDEX	11	11	0	11	11	0	22	22	0
	MAGNESIUM	11	11	0	11	11	0	22	22	0
	SODIUM	11	11	0	11	11	0	22	22	0
	AMMONIUM TOTAL	11	11	0	11	4	6	22	10	10
	NITRITE	11	4	7	11	3	7	22	11	11
	TOTAL NITRATES	11	1	5	11	1	3	22	2	7
	NITROGEN TOT KJELD	11	11	0	11	11	0	22	22	0
	PH	11	11	0	11	11	0	22	22	0
	PHOSPHORUS FIL REACT	11	10	1	11	4	6	.	.	.
	PHOSPHORUS TOTAL	11	1	9	11	0	3	.	.	.
	SULPHATE	6	6	0	6	6	0	12	12	0
	TURBIDITY	11	11	0	11	10	1	22	22	0
*TOTAL SCAN CHEMISTRY (LAB)		225	182	22	226	165	27	397	332	29
METALS	SILVER	11	0	2	11	0	3	22	0	5
	ALUMINUM	11	11	0	11	11	0	22	22	0
	ARSENIC	11	0	6	11	0	5	22	0	15
	BARIUM	11	11	0	11	11	0	22	22	0
	BORON	11	11	0	11	11	0	22	22	0
	BERYLLIUM	11	1	6	11	0	9	22	0	12

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SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS	CADMIUM	11	0	0	11	0	2	22	0	10
	COBALT	11	0	9	11	0	10	22	0	20
	CHROMIUM	11	6	4	11	5	4	22	6	8
	COPPER	11	0	11	11	0	11	22	16	6
	IRON	11	11	0	11	9	2	22	22	0
	MERCURY	10	4	5	11	4	5	11	0	3
	MANGANESE	11	11	0	11	11	0	22	22	0
	MOLYBDENUM	11	11	0	11	11	0	22	20	2
	NICKEL	11	0	2	11	1	2	22	4	2
	LEAD	11	1	8	11	0	9	22	22	0
	ANTIMONY	11	3	4	11	4	3	22	6	11
	SELENIUM	11	0	8	11	0	9	22	0	21
	STRONTIUM	11	11	0	11	11	0	22	22	0
	TITANIUM	11	11	0	11	11	0	22	22	0
	THALLIUM	11	0	0	11	0	1	22	0	7
	URANIUM	11	0	11	11	0	11	22	0	21
	VANADIUM	11	0	11	11	0	11	22	0	18
	ZINC	11	0	11	11	11	0	22	22	0
*TOTAL SCAN METALS		263	103	98	264	111	97	517	250	161
*TOTAL GROUP INORGANIC & PHYSICAL		510	307	120	545	331	124	971	639	190
CHLOROAROMATICS	HEXACHLOROBUTADIENE	11	0	0	11	0	0	11	0	0
	123 TRICHLOROBENZENE	11	0	0	11	0	0	11	0	0

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SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHLOROAROMATICS	1234 T-CHLOROBENZENE	11	0	0	11	0	0	11	0	0
	1235 T-CHLOROBENZENE	11	0	0	11	0	0	11	0	0
	124 TRICHLOROBENZENE	11	0	0	11	0	0	11	0	0
	1245 T-CHLOROBENZENE	11	0	0	11	0	0	11	0	0
	135 TRICHLOROBENZENE	11	0	0	11	0	0	11	0	0
	HCB	11	0	0	11	0	0	11	0	0
	HEXACHLOROETHANE	11	0	0	11	0	1	11	0	0
	OCTACHLOROSTYRENE	11	0	0	11	0	0	11	0	0
	PENTACHLOROBENZENE	11	0	0	11	0	0	11	0	0
	236 TRICHLOROTOLUENE	11	0	0	11	0	0	11	0	0
	245 TRICHLOROTOLUENE	11	0	0	11	0	0	11	0	0
	26A TRICHLOROTOLUENE	11	0	0	11	0	0	11	0	0
*TOTAL SCAN CHLOROAROMATICS		154	0	0	154	0	1	154	0	0
CHLOROPHENOLS	234 TRICHLOROPHENOL	2	0	0	1	0	0	.	.	.
	2345 T-CHLOROPHENOL	2	0	0	1	0	0	.	.	.
	2356 T-CHLOROPHENOL	2	0	0	1	0	0	.	.	.
	245-TRICHLOROPHENOL	2	0	0	1	0	0	.	.	.
	246-TRICHLOROPHENOL	2	0	0	1	0	0	.	.	.
	PENTACHLOROPHENOL	2	0	0	1	0	0	.	.	.
*TOTAL SCAN CHLOROPHENOLS		12	0	0	6	0	0	0	0	0

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SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PAH	PHENANTHRENE	11	0	0	11	0	0	.	.	.
	ANTHRACENE	11	0	0	11	0	0	.	.	.
	FLUORANTHENE	11	0	0	11	0	0	.	.	.
	PYRENE	11	0	0	11	0	0	.	.	.
	BENZO(A)ANTHRACENE	11	0	0	11	0	0	.	.	.
	CHRYSENE	11	0	0	11	0	0	.	.	.
	DIMETH. BENZ(A)ANTHR	11	0	0	11	0	0	.	.	.
	BENZO(E) PYRENE	11	0	0	11	0	0	.	.	.
	BENZO(J) FLUORANTHEN	0	0	0	0	0	0	.	.	.
	BENZO(B) FLUORANTHEN	11	0	0	11	0	0	.	.	.
	PERYLENE	11	0	0	11	0	0	.	.	.
	BENZO(K) FLUORANTHEN	11	0	0	11	0	0	.	.	.
	BENZO(A) PYRENE	11	0	0	11	0	0	.	.	.
	BENZO(G,H,I) PERYLEN	11	0	0	11	0	0	.	.	.
	DIBENZO(A,H) ANTHRAC	11	0	0	11	0	0	.	.	.
	INDENO(1,2,3-C,D) PY	11	0	0	11	0	0	.	.	.
	BENZO(B) CHRYSENE	11	0	0	11	0	0	.	.	.
	ANTHANTHRENE	0	0	0	0	0	0	.	.	.
	CORONENE	11	0	0	11	0	0	.	.	.
*TOTAL SCAN PAH		187	0	0	187	0	0	0	0	0
PESTICIDES & PCB	ALDRIN	11	0	0	11	0	0	11	0	0
	ALPHA BHC	11	0	0	11	0	0	11	0	1

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	BETA BHC	11	0	0	11	0	0	11	0	0
	LINDANE	11	0	0	11	0	0	11	0	0
	ALPHA CHLORDANE	11	0	0	11	0	0	11	0	0
	GAMMA CHLORDANE	11	0	0	11	0	0	11	0	0
	DIELDRIN	11	0	0	11	0	0	11	0	0
	METHOXYCHLOR	11	0	0	11	0	0	11	0	0
	ENDOSULFAN I	11	0	0	11	0	0	11	0	0
	ENDOSULFAN II	11	0	0	11	0	0	11	0	0
	ENDRIN	11	0	0	11	0	0	11	0	0
	ENDOSULFAN SULPHATE	11	0	0	11	0	0	11	0	0
	HEPTACHLOR EPOXIDE	11	0	0	11	0	0	11	0	0
	HEPTACHLOR	11	0	0	11	0	0	11	0	0
	MIREX	11	0	0	11	0	0	11	0	0
	OXYCHLORDANE	11	0	0	11	0	0	11	0	0
	OPDDT	11	0	0	11	0	0	11	0	0
	PCB	11	0	0	11	0	0	11	0	0
	DDD	11	0	0	11	0	0	11	0	0
	PPDDE	11	0	0	11	0	0	11	0	0
	PPDDT	11	0	0	11	0	0	11	0	0
	AMETRINE	11	0	0	10	0	0	10	0	0
	ATRAZINE	11	0	0	10	0	0	10	0	0
	ATRATONE	11	0	0	10	0	0	10	0	0
	CYANAZINE	11	0	0	10	0	0	10	0	0
	DES ETHYL ATRAZINE	6	0	0	6	0	0	6	0	0
	DES ETHYL SIMAZINE	6	0	0	6	0	0	6	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE

SUMMARY TABLE OF RESULTS (1988)

		RAW			TREATED			SITE 1		
SCAN	PARAMETER	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	PROMETONE	11	0	0	10	0	0	10	0	0
	PROPAZINE	11	0	0	10	0	0	10	0	0
	PROMETRYNE	11	0	0	10	0	0	10	0	0
	METRIBUZIN	11	0	0	10	0	0	10	0	0
	SIMAZINE	11	0	0	10	0	0	10	0	0
	ALACHLOR	11	0	0	10	0	0	10	0	0
	METOLACHLOR	11	0	0	10	0	0	10	0	0
*TOTAL SCAN PESTICIDES & PCB		364	0	0	353	0	0	353	0	1
PHENOLICS	PHENOLICS	11	3	3	11	1	6	.	.	.
*TOTAL SCAN PHENOLICS		11	3	3	11	1	6	0	0	0
SPECIFIC PESTICIDES	TOXAPHENE	1	0	0	1	0	0	1	0	0
	2,4,5-T	2	0	0	1	0	0	.	.	.
	2,4-D	2	0	0	1	0	0	.	.	.
	2,4-DB	2	0	0	1	0	0	.	.	.
	2,4 D PROPIONIC ACID	2	0	0	1	0	0	.	.	.
	DICAMBA	2	0	0	1	0	0	.	.	.
	PICHLORAM	0	0	0	0	0	0	.	.	.
	SILVEX	2	0	0	1	0	0	.	.	.
	DIAZINON	2	0	0	2	0	0	.	.	.

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
SPECIFIC PESTICIDES	DICHLOROVOS	2	0	0	2	0	0	.	.	.
	CHLORPYRIFOS	2	0	0	2	0	0	.	.	.
	ETHION	2	0	0	2	0	0	.	.	.
	AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.
	MALATHION	2	0	0	2	0	0	.	.	.
	MEVINPHOS	2	0	0	2	0	0	.	.	.
	METHYL PARATHION	2	0	0	2	0	0	.	.	.
	METHYLTRITHION	2	0	0	2	0	0	.	.	.
	PARATHION	2	0	0	2	0	0	.	.	.
	PHORATE	2	0	0	2	0	0	.	.	.
	RELDAN	2	0	0	2	0	0	.	.	.
	RONNEL	2	0	0	2	0	0	.	.	.
	AMINOCARB	0	0	0	0	0	0	.	.	.
	BENOMYL	2	0	0	2	0	0	.	.	.
	BUX	2	0	0	2	0	0	.	.	.
	CARBOFURAN	2	0	0	2	0	0	.	.	.
	CICP	2	0	0	2	0	0	.	.	.
	DIALLATE	2	0	0	2	0	0	.	.	.
	EPTAM	2	0	0	2	0	0	.	.	.
	IPC	2	0	0	2	0	0	.	.	.
	PROPOXUR	2	0	0	2	0	0	.	.	.
	CARBARYL	2	0	0	2	0	0	.	.	.
	BUTYLATE	2	0	0	2	0	0	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES		57	0	0	51	0	0	1	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
VOLATILES	BENZENE	10	0	0	10	0	0	10	0	1
	TOLUENE	10	0	2	10	1	2	10	1	3
	ETHYLBENZENE	10	0	8	10	0	6	10	0	6
	P-XYLENE	10	0	0	10	0	0	10	0	0
	M-XYLENE	10	0	1	10	0	1	10	0	3
	O-XYLENE	10	0	0	10	0	2	10	0	4
	STYRENE	4	1	3	4	0	1	4	0	2
	1,1 DICHLOROETHYLENE	10	0	0	10	0	0	10	0	0
	METHYLENE CHLORIDE	10	0	0	10	0	0	10	0	0
	T1,2DICHLOROETHYLENE	10	0	0	10	0	0	10	0	0
	1,1 DICHLOROETHANE	10	0	0	10	0	0	10	0	0
	CHLOROFORM	10	0	1	10	9	0	10	9	1
	111, TRICHLOROETHANE	10	0	0	10	0	0	10	0	0
	1,2 DICHLOROETHANE	10	0	0	10	0	0	10	0	0
	CARBON TETRACHLORIDE	10	0	0	10	0	0	10	0	0
	1,2 DICHLOROPROPANE	10	0	0	10	0	0	10	0	0
	TRICHLOROETHYLENE	10	0	0	10	0	0	10	0	0
	DICHLOROBROMOMETHANE	10	0	0	10	9	0	10	9	0
	112 TRICHLOROETHANE	10	0	0	10	0	0	10	0	0
	CHLORODIBROMOMETHANE	10	0	0	10	9	0	10	9	0
	T-CHLOROETHYLENE	10	0	0	10	0	0	10	0	1
	BROMOFORM	10	0	0	10	0	0	10	0	0
	1122 T-CHLOROETHANE	10	0	0	10	0	0	10	0	0
	CHLOROBENZENE	10	0	0	10	0	0	10	0	0
	1,4 DICHLOROBENZENE	10	0	0	10	0	0	10	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	RAW			TREATED			SITE 1		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
VOLATILES	1,3 DICHLOROBENZENE	10	0	0	10	0	0	10	0	0
	1,2 DICHLOROBENZENE	10	0	0	10	0	0	10	0	0
	TRIFLUOROCHLOROTOLUE	4	0	0	4	0	0	4	0	0
	ETHLYENE DIBROMIDE	10	0	0	10	0	0	10	0	0
	TOTL TRIHALOMETHANES	10	0	0	10	9	0	10	9	0
*TOTAL SCAN VOLATILES		288	1	15	288	37	12	288	37	21
*TOTAL GROUP ORGANIC		1073	4	18	1050	38	19	796	37	22
TOTAL		1613	314	138	1628	371	143	1800	683	212

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
1*. MAC for Bacteriological Analyses
Poor water quality is indicated when :
- total coliform counts > 0 < 5
- P/A Bottle Test is present after 48 hours
- Aeromonas organisms are detected in more than 25% of samples in a single submission or in successive submissions from the same sampling site
- Pseudomonas Aeruginosa, Staphylococcus Aureus and members of the Fecal Streptococcus group should not be detected in any sample
- Standard Plate Count should not exceed 500 organisms per ml at 35 ^{0}C within 48 hours

2. Interim Maximum Acceptable Concentration (IMAC)
3. Maximum Desirable Concentration (MDC)
4. Aesthetic or Recommended Operational Guideline
- hardness levels between 80 and 100 mg/L as calcium carbonate are considered to provide an acceptable balance between corrosion and incrustation, water supplies with a hardness >200 mg/L are considered poor and those in excess of 500 mg/L are unacceptable.

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO) (for xylenes, the AO is a total)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

H USSR MAXIMUM PERMISSIBLE CONCENTRATION

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

INTERPRETATION OF DATA

The interpretation of analytical results that are obtained from measurements near the limit of detection of the measurement process is subject to greater uncertainty than those at higher concentrations. The principle areas of concern relate to whether the substance has actually been detected, whether it has been properly identified, and whether it is an artifact of the measurement process. In other words, false positives can be caused by the instrumentation or the test procedures used, when in fact these compounds are not present in the sample.

There are several methods to treat data from such measurements:
1. Exclude the low-level data because of this uncertainty factor. However, studies of long-term environmental trends and modelling may be adversely affected by exclusion of such data.
2. Qualify these data so the user is aware of the greater uncertainty associated with their use.

For the Drinking Water Surveillance Program, measurements near the limit of detection of the measurement process are reported qualified by the code "<T". Results quantified by "W" indicate a zero measurement. These results are reported for purposes of modelling and long-term trend analysis and no significance should be attributed to a single determination of a substance below "T" (a single determination may well be a false positive). Repeat analysis or additional data are needed before it can be stated with certainty that the substance in question was truly present. On the other hand, it is less likely that repeated detection of a substance at or near the limit of detection at a specific location is solely due to an artifact in the measurement system, and more likely represents a true positive. However the average of such data is still only an estimate of the amount of substance present subject to the possible biases of the method used.

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurable Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!AW	No Data: Analysis Withdrawn
!CR	No Data: Could Not Confirm By Reanalysis
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!LA	No Data: Laboratory Accident

!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant
UAL	Unreliable: Sample Age Exceeds Normal Limit
UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminant Interference
XP	Positive After X Number of Hours
T# (T06)	Result Taken After # Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM		
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
BACTERIOLOGICAL					
FECAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = 0 (A1)
FEB	0	.	.	.	
MAR	0	.	.	.	
APR	0	.	.	.	
MAY	0	.	.	.	
JUN	0	.	.	.	
JUL	0	.	.	.	
OCT	0	.	.	.	
NOV	0 T24	.	.	.	
DEC	0 T48	.	.	.	
STANDRD PLATE CNT MF (CT/ML)			DET'N LIMIT = 0		GUIDELINE = 500/ML (A1)
FEB	!AW	!AW	.	!AW	
MAR	!AW	!AW	.	!AW	
APR	1	0	.	1	
MAY	!AW	!AW	.	!AW	
JUN	3	0	.	204	
JUL	2400 >	0	.	2400 >	
AUG	.	!AW	.	!AW	
OCT	.	18 T48	.	960 T24	
NOV	.	1 <=>	.	54 T06	
DEC	.	8 <=>	.	38 T24	
P/A BOTTLE ( )			DET'N LIMIT = 0		GUIDELINE = 0 (A1*)
FEB	.	0	.	0	
MAR	.	0	.	0	
APR	.	0	.	0	
MAY	.	0	.	0	
JUN	.	0	.	0	
JUL	.	0	.	0	
AUG	.	0	.	0	
TOTAL COLIFORM MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)
FEB	BDL	0	.	0	
MAR	BDL	0	.	0	
APR	0	0	.	0	
MAY	BDL	0	.	0	
JUN	0	0	.	0	
JUL	BDL	0	.	0	
AUG	.	0	.	0	
OCT	0	0 T48	.	0 T24	
NOV	0 T24	0 T24	.	0 T06	
DEC	0 T48	0 T48	.	0 T24	
T COLIFORM BCKGRD MF (CT/100ML)			DET'N LIMIT = 0		GUIDELINE = N/A
FEB	BDL	0	.	0	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAR	BDL	0	.	0
APR	0	0	.	0
MAY	BDL	0	.	0
JUN	0	0	.	0
JUL	BDL	0	.	85
AUG	.	0	.	0
OCT	0	1 T48	.	0 T24
NOV	0 T24	0 T24	.	0 T06
DEC	0 T48	0 T48	.	0 T24

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHEMISTRY (FLD)				
FLD CHLORINE (COMB) ( )			DET'N LIMIT = N/A	GUIDELINE = N/A
FEB	.	.700	.	1.200
MAR	.	.500	.	.200
APR	.	.400	.	.200
MAY	.	.500	.	.
JUN	.	.500	.	.
JUL	.	.800	.	.
AUG	.	.800	.	.
SEP	.	1.100	.	.
OCT	.	.800	.	.
NOV	.	.800	.	.700
DEC	.	1.000	.	.
FLD CHLORINE FREE ( )			DET'N LIMIT = N/A	GUIDELINE = N/A
FEB	.	1.900	.	.500
MAR	.	1.200	.	.700
APR	.	3.000	.	.900
MAY	.	1.500	.	.
JUN	.	1.600	.	.300
JUL	.	2.200	.	.
AUG	.	2.200	.	.
SEP	.	1.900	.	.
OCT	.	1.800	.	.
NOV	.	2.200	.	.
DEC	.	2.400	.	.
FLD CHLORINE (TOTAL) ( )			DET'N LIMIT = N/A	GUIDELINE = N/A
FEB	.	2.600	.	1.700
MAR	.	1.700	.	.900
APR	.	3.400	.	1.100
MAY	.	2.000	.	.
JUN	.	2.100	.	.300
JUL	.	3.000	.	.
AUG	.	3.000	.	.
SEP	.	3.000	.	.
OCT	.	2.600	.	.
NOV	.	3.000	.	.700
DEC	.	3.400	.	.
FLD PH (DMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
FEB	7.400	7.400	7.400	7.200
MAR	7.400	7.400	7.500	7.200
APR	7.400	7.400	7.400	7.400
MAY	7.400	7.500	7.600	7.400
JUN	7.400	7.400	7.400	7.400
JUL	7.400	7.400	7.600	7.400

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
AUG	7.400	7.500	7.500	7.400
SEP	7.400	7.400	7.400	7.400
OCT	7.400	7.400	7.500	7.400
NOV	7.400	7.500	7.400	7.200
DEC	7.400	7.400	7.500	7.200
FLD TEMPERATURE (DEG.C)			DET'N LIMIT = N/A	GUIDELINE = 15 (A1)
FEB	11.000	11.000	7.000	5.000
MAR	11.000	11.000	10.000	6.000
APR	11.000	11.000	11.000	10.000
MAY	11.000	11.000	15.000	13.000
JUN	11.000	11.000	21.000	18.000
JUL	11.000	11.000	23.000	22.000
AUG	11.000	11.000	25.000	18.000
SEP	11.000	11.000	20.000	19.000
OCT	11.000	11.000	17.500	15.000
NOV	11.000	11.000	14.000	12.000
DEC	11.000	11.000	11.000	9.500

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
CHEMISTRY (LAB)					
ALKALINITY (MG/L)			DET'N LIMIT = .200		GUIDELINE = 30-500 (A4)
FEB	268.500	263.500	264.800	263.700	
MAR	271.300	266.000	266.300	267.100	
APR	276.000	269.200	264.000	263.200	
MAY	273.900	271.700	271.700	269.600	
JUN	272.800	267.400	269.500	271.000	
JUL	269.000	265.500	266.200	267.100	
AUG	268.900	265.400	264.000	263.000	
SEP	266.800	261.000	257.800	261.500	
OCT	275.700	275.100	268.500	272.900	
NOV	283.600	280.900	269.600	267.800	
DEC	275.400	269.400	271.900	274.400	
CALCIUM (MG/L)			DET'N LIMIT = .100		GUIDELINE = 100 (F2)
FEB	85.800	85.200	87.800	86.000	
MAR	88.600	88.400	86.000	86.200	
APR	85.200	87.200	85.000	86.400	
MAY	86.200	84.600	84.800	88.800	
JUN	84.200	86.600	83.200	87.200	
JUL	84.200	85.600	89.600	90.200	
AUG	86.400	91.200	87.800	90.200	
SEP	94.800	89.200	86.400	89.000	
OCT	86.200	85.400	81.400	83.400	
NOV	98.400	104.000	90.800	93.000	
DEC	88.800	87.000	80.400	94.400	
CHLORIDE (MG/L)			DET'N LIMIT = .200		GUIDELINE = 250 (A3)
FEB	10.800	14.700	14.900	14.700	
MAR	10.200	13.200	14.100	13.800	
APR	10.300	14.200	14.300	14.300	
MAY	10.300	12.900	13.700	13.800	
JUN	10.200	13.700	15.100	14.300	
JUL	10.000	13.100	14.100	14.100	
AUG	11.100	14.500	14.500	14.300	
SEP	10.400	13.300	14.300	14.100	
OCT	10.800	10.800	11.000	10.300	
NOV	13.000	16.400	16.900	16.400	
DEC	11.900	16.000	16.600	16.700	
COLOUR (HZU)			DET'N LIMIT = .5		GUIDELINE = 5.0 (A3)
FEB	29.000	5.000	18.000	6.500	
MAR	24.500	4.000	24.500	6.500	
APR	28.000	3.500	31.000	13.500	
MAY	26.500	6.000	3.000	16.500	
JUN	14.000	2.000 <T	9.000	4.500	
JUL	31.500	4.000	72.500 RRV	43.000 RRV	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
AUG	19.000	4.500	6.000	7.000	
SEP	19.500	4.500	2.000 <T	29.500	
OCT	19.000	7.500	12.000	9.000	
NOV	17.500	3.000	3.500	5.000	
DEC	11.000	2.500	6.500	5.000	
CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1		GUIDELINE = 400 (F2)
FEB	534	537	539	533	
MAR	530	530	524	533	
APR	526	529	514	515	
MAY	537	538	534	548	
JUN	533	541	535	560	
JUL	525	527	533	538	
AUG	544	548	543	538	
SEP	525	528	509	531	
OCT	541	540	514	528	
NOV	585	590	554	557	
DEC	543	549	548	567	
FLUORIDE (MG/L)			DET'N LIMIT = .01		GUIDELINE = 2.400 (A1)
FEB	.330	.320	.290	.320	
MAR	.270	.290	.290	.310	
APR	.310	.310	.320	.290	
MAY	.290	.290	.310	.310	
JUN	.320	.320	.320	.310	
JUL	.320	.320	.310	.310	
AUG	.320	.320	.320	.300	
SEP	.340	.340	.340	.320	
OCT	.320	.320	.320	.320	
NOV	.300	.300	.320	.320	
DEC	.320	.320	.340	.320	
HARDNESS (MG/L)			DET'N LIMIT = .500		GUIDELINE = 80-100 (A4)
FEB	269.000	268.000	274.000	270.000	
MAR	275.000	275.000	268.000	269.000	
APR	266.000	265.000	265.000	267.000	
MAY	267.000	263.000	263.000	275.000	
JUN	260.000	265.000	258.000	269.000	
JUL	261.000	265.000	276.000	277.000	
AUG	269.000	281.000	272.000	280.000	
SEP	289.000	274.000	266.000	275.000	
OCT	266.000	264.000	252.000	257.000	
NOV	304.000	318.000	281.000	286.000	
DEC	272.000	268.000	254.000	289.000	
IONCAL (DIMNSLESS)			DET'N LIMIT = N/A		GUIDELINE = N/A
FEB	.000 NAF	.000 NAF	.000 NAF	.000 NAF	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM TRAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAR	.000 NAF	.000 NAF	.000 NAF	.000 NAF
APR	.000 NAF	.000 NAF	.000 NAF	.000 NAF
MAY	.000 NAF	.000 NAF	.000 NAF	.000 NAF
JUN	.000 NAF	.000 NAF	.000 NAF	.000 NAF
JUL	1.997	.891	1.716	.792
AUG	1.565	1.163	.016	2.210
SEP	7.102	2.251	2.641	1.648
OCT	4.300	4.350	4.390	5.490
NOV	.865	4.895	.455	1.310
DEC	2.217	3.648	9.312	.086
LANGELIERS INDEX (DIMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = N/A
FEB	.868 NAF	.817 NAF	.952 NAF	1.112 NA.
MAR	1.027 NAF	1.038 NAF	1.167 NAF	.998 NAF
APR	1.198 NAF	1.207 NAF	1.199 NAF	1.225 NAF
MAY	.939 NAF	1.017 NAF	1.118 NAF	.904 NAF
JUN	1.157 NAF	1.150 NAF	1.206 NAF	1.247 NAF
JUL	1.072	1.063	1.153	1.067
AUG	.961	.908	.950	1.241
SEP	1.120	1.063	1.166	1.323
OCT	1.121	1.126	1.207	1.204
NOV	.977	.956	.923	.970
DEC	1.053	.994	1.154	1.086
MAGNESIUM (MG/L)			DET'N LIMIT = .050	GUIDELINE = 30 (F2)
FEB	13.300	13.400	13.400	13.400
MAR	13.100	13.200	12.900	13.200
APR	12.900	11.500	12.700	12.500
MAY	12.500	12.500	12.400	12.800
JUN	12.000	11.800	12.200	12.400
JUL	12.200	12.400	12.700	12.500
AUG	12.900	12.900	12.800	13.200
SEP	12.800	12.600	12.300	12.600
OCT	12.200	12.400	11.700	12.000
NOV	14.100	14.100	13.200	13.100
DEC	12.200	12.200	12.900	12.900
SODIUM (MG/L)			DET'N LIMIT = .200	GUIDELINE = 200 (C3)
FEB	12.200	12.400	12.600	12.600
MAR	11.400	11.200	11.400	11.400
APR	11.000	11.600	11.400	11.000
MAY	11.400	11.400	11.600	11.400
JUN	10.800	10.800	11.400	11.200
JUL	12.400	12.200	12.400	12.200
AUG	12.400	11.400	12.200	12.200
SEP	12.400	12.000	12.000	12.000
OCT	12.600	12.800	12.400	12.200

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEN
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
NOV	12.200	12.600	12.800	12.200	
DEC	13.200	13.600	13.400	13.200	
AMMONIUM TOTAL (MG/L)			DET'N LIMIT = 0.002		GUIDELINE = .05 (F2)
FEB	.156	.004 <T	.006 <T	.010	
MAR	.136	.018	.008 <T	.018	
APR	.154	.002 <T	.002 <T	.004 <T	
MAY	.152	.012	.024	.008 <T	
JUN	.166	.004 <T	.018	.018	
JUL	.156	.004 <T	.002 <T	.006 <T	
AUG	.132	BDL	.002 <T	BDL	
SEP	.164	.020	.018	.020	
OCT	.152	.142	.090	.124	
NOV	.150	.002 <T	BDL	.004 <T	
DEC	.162	.008 <T	.008 <T	.012	
NITRITE (MG/L)			DET'N LIMIT = 0.001		GUIDELINE = 1.000 (A1)
FEB	.003 <T	.001 <T	.006	.001 <T	
MAR	.010	.010	.008	.011	
APR	.003 <T	.001 <T	.003 <T	.002 <T	
MAY	.003 <T	.002 <T	.004 <T	.002 <T	
JUN	.003 <T	BDL	.006	.003 <T	
JUL	.003 <T	.001 <T	.005	.004 <T	
AUG	.002 <T	.001 <T	.002 <T	.002 <T	
SEP	.003 <T	.002 <T	.011	.004 <T	
OCT	.006	.004	.012	.007	
NOV	.007	.007	.004 <T	.005	
DEC	.005	.003 <T	.013	.005	
TOTAL NITRATES (MG/L)			DET'N LIMIT = .020		GUIDELINE = 10.000 (A1)
FEB	.030 <T	BDL	BDL	BDL	
MAR	.020 <T	BDL	BDL	BDL	
APR	BDL	BDL	BDL	BDL	
MAY	BDL	.020 <T	.020 <T	BDL	
JUN	.020 <T	BDL	BDL	.020 <T	
JUL	BDL	BDL	.025 <T	BDL	
AUG	BDL	BDL	BDL	BDL	
SEP	.020 <T	.025 <T	.020 <T	.020 <T	
OCT	.020	.020	.020	.020	
NOV	BDL	BDL	BDL	BDL	
DEC	.020 <T	.025 <T	.020 <T	.020 <T	
NITROGEN TOT KJELD (MG/L)			DET'N LIMIT = .020		GUIDELINE = N/A
FEB	.320	.120	.230	.150	
MAR	.280	.130	.180	.110	
APR	.330	.150	.240	.160	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAY	.270	.150	.200	.130
JUN	.330	.110	.200	.140
JUL	.300	.120	.200	.130
AUG	.300	.160	.180	.140
SEP	.330	.140	.200	.130
OCT	.290	.270	.300	.250
NOV	.300	.120	.250	.110
DEC	.320	.120	.270	.130
PH (DIMNSLESS)			DET'N LIMIT = N/A	GUIDELINE = 6.5-8.5(A4)
FEB	7.970	7.930	8.050	8.220
MAR	8.110	8.130	8.270	8.100
APR	8.290	8.300	8.310	8.330
MAY	8.030	8.120	8.220	7.990
JUN	8.260	8.250	8.320	8.340
JUL	8.180	8.170	8.240	8.150
AUG	8.060	7.990	8.050	8.330
SEP	8.180	8.160	8.280	8.320
OCT	8.210	8.220	8.330	8.310
NOV	8.000	7.960	8.000	8.040
DEC	8.130	8.090	8.280	8.140
PHOSPHORUS FIL REACT (MG/L)			DET'N LIMIT = .0005	GUIDELINE = N/A
FEB	.007	.002 <T	.	.
MAR	.004	.002	.	.
APR	.005	.001 <T	.	.
MAY	.003 RVU	.003	.	.
JUN	.009	.002	.	.
JUL	.002 <T	.002 <T	.	.
AUG	.003	.001 <T	.	.
SEP	.006	.003	.	.
OCT	.003	.000	.	.
NOV	.005	.001 <T	.	.
DEC	.005	.002 <T	.	.
PHOSPHORUS TOTAL (MG/L)			DET'N LIMIT = .002	GUIDELINE = .40 (F2)
FEB	.007 <T	BDL	.	.
MAR	.007 <T	BDL	.	.
APR	.008 <T	.002 <T	.	.
MAY	.007 <T	BDL	.	.
JUN	.008 <T	.002 <T	.	.
JUL	.002 <T	BDL	.	.
AUG	BDL	BDL	.	.
SEP	.011	.006 <T		.
OCT	.006 <T	BDL	.	.
NOV	.008 <T	BDL	.	.
DEC	.007 <T	BDL	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
SULPHATE ( )			DET'N LIMIT = .200		GUIDELINE = 500. (A3)
JUL	10.190	9.530	11.190	13.290	
AUG	15.700	15.600	13.400	15.600	
SEP	13.800	13.700	6.640	13.300	
OCT	14.390	14.330	6.530	12.190	
NOV	25.000	24.000	13.500	17.000	
DEC	15.020	15.000	13.400	19.000	
TURBIDITY (FTU)			DET'N LIMIT = .02		GUIDELINE = 1.00 (A1)
FEB	5.900	.280	6.200	.630	
MAR	3.400	.150	8.800	.400	
APR	5.200	.260	15.500	2.700	
MAY	4.200	.170	35.000	4.100	
JUN	4.600	.230	48.000	1.400	
JUL	1.800	.240	25.000 RRV	8.500 RRV	
AUG	3.600	.550	17.200 RRV	.620	
SEP	4.000	.600	58.000	9.900	
OCT	3.500	.220 <T	36.000	2.000	
NOV	5.000	.390	46.000	.630	
DEC	2.700	.370	59.000	.930	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
METALS				
SILVER (UG/L)			DET'N LIMIT = .020	GUIDELINE = 50. (A1)
FEB	.030 <T	BDL	.020 <T	.020 <T
MAR	.020 <T	.020 <T	.020 <T	.020 <T
APR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	BDL
JUN	BDL	BDL	BDL	.040 <T
JUL	BDL	BDL	BDL	BDL
AUG	BDL	BDL	BDL	BDL
SEP	BDL	.160 <T	BDL	BDL
OCT	BDL	.030 <T	BDL	BDL
NOV	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL
ALUMINUM (UG/L)			DET'N LIMIT = .050	GUIDELINE = 100.(A4)
FEB	6.264	6.960	7.192	6.612
MAR	1.972	2.552	2.900	1.972
APR	4.292	4.872	4.872	4.292
MAY	4.408	4.292	4.292	4.756
JUN	11.484	11.600	13.920	12.760
JUL	1.740	1.972	3.480	2.204
AUG	6.496	6.148	6.612	6.380
SEP	9.048	8.700	10.208	8.468
OCT	2.552	2.552	3.828	2.320
NOV	5.452	4.756	7.308	5.916
DEC	6.032	5.452	7.888	4.872
ARSENIC (UG/L)			DET'N LIMIT = 0.050	GUIDELINE = 50.0 (A1)
FEB	BDL	.090 <T	.210 <T	.140 <T
MAR	.180 <T	.110 <T	.130 <T	BDL
APR	BDL	BDL	.140 <T	.060 <T
MAY	.070 <T	.140 <T	.160 <T	.140 <T
JUN	BDL	BDL	BDL	BDL
JUL	BDL	BDL	BDL	BDL
AUG	.090 <T	.110 <T	.210 <T	.090 <T
SEP	BDL	BDL	BDL	BDL
OCT	.080 <T	BDL	.070 <T	.060 <T
NOV	.100 <T	BDL	.120 <T	.110 <T
DEC	.140 <T	.200 <T	.150 <T	.130 <T
BARIUM (UG/L)			DET'N LIMIT = 0.020	GUIDELINE = 1000. (A1)
FEB	160.000	120.000	120.000	120.000
MAR	170.000	130.000	130.000	130.000
APR	190.000	150.000	150.000	140.000
MAY	190.000	140.000	140.000	140.000
JUN	210.000	160.000	170.000	160.000
JUL	190.000	150.000	150.000	140.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
AUG	210.000	170.000	160.000	150.000	
SEP	200.000	150.000	150.000	150.000	
OCT	190.000	150.000	140.000	140.000	
NOV	220.000	160.000	150.000	150.000	
DEC	200.000	150.000	160.000	150.000	
BORON (UG/L)			DET'N LIMIT = 0.200		GUIDELINE = 5000. (A1)
FEB	86.000	84.000	87.000	87.000	
MAR	85.000	81.000	85.000	80.000	
APR	78.000	73.000	82.000	76.000	
MAY	91.000	95.000	89.000	87.000	
JUN	120.000	100.000	100.000	140.000	
JUL	99.000	94.000	100.000	96.000	
AUG	170.000	170.000	97.000	90.000	
SEP	210.000	190.000	200.000	180.000	
OCT	110.000	110.000	100.000	100.000	
NOV	270.000	150.000	200.000	220.000	
DEC	210.000	170.000	110.000	96.000	
BERYLLIUM (UG/L)			DET'N LIMIT = 0.010		GUIDELINE = .20 (H)
FEB	.030 <T	.040 <T	.040 <T	.040 <T	
MAR	.030 <T	.010 <T	.010 <T	.020 <T	
APR	.050 <T	.040 <T	BDL	.050 <T	
MAY	BDL	BDL	BDL	BDL	
JUN	BDL	BDL	BDL	BDL	
JUL	BDL	.020 <T	.070 <T	.030 <T	
AUG	.060 <T	.060 <T	BDL	BDL	
SEP	.210 <T	.180 <T	.230 <T	.150 <T	
OCT	BDL	.030 <T	.060 <T	BDL	
NOV	.520	.200 <T	.270 <T	.270 <T	
DEC	.120 <T	.050 <T	BDL	BDL	
CADMIUM (UG/L)			DET'N LIMIT = 0.050		GUIDELINE = 5.000 (A1)
FEB	BDL	BDL	.100 <T	BDL	
MAR	BDL	.050 <T	.120 <T	BDL	
APR	BDL	BDL	.190 <T	BDL	
MAY	BDL	BDL	.120 <T	BDL	
JUN	BDL	.060 <T	.110 <T	.070 <T	
JUL	BDL	BDL	BDL	BDL	
AUG	BDL	BDL	.120 <T	BDL	
SEP	BDL	BDL	.080 <T	BDL	
OCT	BDL	BDL	BDL	BDL	
NOV	BDL	BDL	.120 <T	BDL	
DEC	BDL	BDL	.170 <T	BDL	
COBALT (UG/L)			DET'N LIMIT = 0.020		GUIDELINE = 1000 (H)
FEB	BDL	BDL	BDL	BDL	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
MAR	.270 <T	.280 <T	.330 <T	.330 <T	
APR	.150 <T	.190 <T	.190 <T	.200 <T	
MAY	.260 <T	.230 <T	.250 <T	.270 <T	
JUN	.110 <T	.130 <T	.170 <T	.150 <T	
JUL	BDL	.050 <T	.050 <T	.040 <T	
AUG	.190 <T	.080 <T	.130 <T	.120 <T	
SEP	.190 <T	.180 <T	.260 <T	.260 <T	
OCT	.220 <T	.220 <T	.320 <T	.230 <T	
NOV	.090 <T	.060 <T	.080 <T	.110 <T	
DEC	.270 <T	.220 <T	.250 <T	.200 <T	
CHROMIUM (UG/L)			DET'N LIMIT = 0.100		GUIDELINE = 50. (A1)
FEB	.570 <T	.170 <T	.290 <T	.200 <T	
MAR	.110 <T	.180 <T	.170 <T	.140 <T	
APR	.420 <T	BDL	BDL	BDL	
MAY	.710 <T	.970 <T	BDL	BDL	
JUN	2.200	.300 <T	.210 <T	4.900	
JUL	BDL	BDL	.130 <T	BDL	
AUG	8.800	8.000	.270 <T	BDL	
SEP	13.000	12.000	13.000	11.000	
OCT	4.900	5.300	2.500	BDL	
NOV	16.000	5.300	5.300	12.000	
DEC	9.900	6.300	.630 <T	BDL	
COPPER (UG/L)			DET'N LIMIT = .100		GUIDELINE = 1000 (A3)
FEB	.150 <T	.230 <T	3.700	3.100	
MAR	.160 <T	.280 <T	2.400	3.800	
APR	.220 <T	.290 <T	2.300	.630 <T	
MAY	.480 <T	.410 <T	2.300	.670 <T	
JUN	.440 <T	.560 <T	6.000	.780 <T	
JUL	.360 <T	.430 <T	5.400	.790 <T	
AUG	.760 <T	.650 <T	4.400	2.000	
SEP	.680 <T	.620 <T	2.600	.710 <T	
OCT	.330 <T	.260 <T	3.700	.350 <T	
NOV	.370 <T	.360 <T	19.000	4.400	
DEC	.260 <T	.320 <T	23.000	3.000	
IRON (UG/L)			DET'N LIMIT = 4.000		GUIDELINE = 300. (A3)
FEB	850.000	69.000	1200.000	180.000	
MAR	890.000	65.000	1900.000	190.000	
APR	960.000	69.000	2400.000	950.000	
MAY	930.000	66.000	3700.000	780.000	
JUN	1000.000	50.000 <T	4700.000	480.000	
JUL	980.000	63.000	3400.000	1500.000	
AUG	1000.000	73.000	3300.000	200.000	
SEP	1100.000	78.000	7300.000	1300.000	
OCT	900.000	75.000	5800.000	490.000	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
NOV	950.000	42.000 <T	5900.000	180.000
DEC	970.000	55.000	7300.000	290.000
MERCURY (UG/L)			DET'N LIMIT = 0.010	GUIDELINE = 1.000 (A1)
FEB	.010	.010	.	BDL
MAR	BDL	BDL	.	BDL
APR	.020	.020	.	BDL
MAY	.020 <T	.020 <T	.	BDL
JUN	.020 <T	.020 <T	.	BDL
JUL	.030 <T	.020 <T	.	BDL
AUG	ISS	.040 <T	.	.020 <T
SEP	.050 <T	BDL	.	BDL
OCT	.080	.100	.	BDL
NOV	.040 <T	.020 <T	.	.020 <T
DEC	.290	.330	.	.030 <T
MANGANESE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 50.0 (A3)
FEB	120.000	27.000	24.000	14.000
MAR	130.000	21.000	28.000	20.000
APR	140.000	17.000	41.000	25.000
MAY	140.000	52.000	54.000	30.000
JUN	140.000	9.200	110.000	81.000
JUL	130.000	12.000	50.000	34.000
AUG	140.000	34.000	43.000	15.000
SEP	140.000	30.000	69.000	24.000
OCT	140.000	39.000	57.000	25.000
NOV	140.000	8.500	53.000	13.000
DEC	140.000	13.000	160.000	9.400
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.020	GUIDELINE = 500 (H)
FEB	.760	.630	.500	.610
MAR	.890	.730	.580	.710
APR	.940	.780	.650	.720
MAY	.910	.720	.630	.790
JUN	.880	.640	.510	.710
JUL	.810	.620	.760	.620
AUG	1.100	.780	.630	.730
SEP	.950	.680	.640	.700
OCT	.840	.680	.600	.750
NOV	1.100	.800	.450 <T	.830
DEC	.790	.750	.340 <T	.820
NICKEL (UG/L)			DET'N LIMIT = 0.100	GUIDELINE = 50. (F3)
FEB	BDL	BDL	21.000	BDL
MAR	BDL	1.700	2.300	.240 <T
APR	.620 <T	.740 <T	9.300	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
MAY	BDL	BDL	BDL	BDL
JUN	BDL	BDL	BDL	BDL
JUL	BDL	BDL	4.400	BDL
AUG	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
OCT	.200 <T	1.400 <T	.880 <T	BDL
NOV	BDL	BDL	BDL	BDL
DEC	BDL	BDL	BDL	BDL
LEAD (UG/L)			DET'N LIMIT = 0.050	GUIDELINE = 50. (A1)
FEB	.040 <T	.070 <T	19.000	.810
MAR	.110 <T	.130 <T	9.400	.890
APR	BDL	.040 <T	10.000	.670
MAY	.210	BDL	3.600	.710
JUN	.040 <T	.080 <T	6.800	.830
JUL	BDL	.030 <T	3.600	.430
AUG	.040 <T	.040 <T	2.800	1.300
SEP	.040 <T	.030 <T	1.500	.400
OCT	.040 <T	BDL	1.500	.510
NOV	.030 <T	.030 <T	10.000	3.300
DEC	.070 <T	.050 <T	17.000	2.500
ANTIMONY (UG/L)			DET'N LIMIT = .050	GUIDELINE = 146. (D4)
FEB	BDL	.020 <T	.090 <T	.020 <T
MAR	.020 <T	.030 <T	.090 <T	.020 <T
APR	BDL	BDL	.090 <T	BDL
MAY	BDL	BDL	.040 <T	.030 <T
JUN	.030 <T	BDL	BDL	BDL
JUL	.030 <T	.050 <T	.070 <T	BDL
AUG	.400	.360	.290	.370
SEP	.410	.520	.310	.410
OCT	BDL	BDL	.030 <T	BDL
NOV	.520	.380	.350	.360
DEC	.190 <T	.210	.180 <T	.180 <T
SELENIUM (UG/L)			DET'N LIMIT = 0.200	GUIDELINE = 10. (A1)
FEB	.560 <T	1.100 <T	.410 <T	1.100 <T
MAR	.310 <T	.820 <T	.380 <T	.600 <T
APR	1.200 <T	1.400 <T	1.000 <T	1.300 <T
MAY	1.100 <T	1.000 <T	1.600 <T	2.300 <T
JUN	BDL	.450 <T	.390 <T	1.000 <T
JUL	BDL	BDL	BDL	.380 <T
AUG	BDL	.460 <T	.620 <T	1.200 <T
SEP	.780 <T	.630 <T	.270 <T	1.700 <T
OCT	.400 <T	BDL	1.300 <T	.400 <T
NOV	.360 <T	1.200 <T	1.300 <T	1.900 <T
DEC	1.400 <T	1.400 <T	1.400 <T	.950 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
STRONTIUM (UG/L)			**DET'N LIMIT = .050**	**GUIDELINE = 2000.(H)**
FEB	180.000	180.000	180.000	180.000
MAR	190.000	190.000	190.000	190.000
APR	210.000	210.000	210.000	210.000
MAY	210.000	210.000	200.000	200.000
JUN	210.000	210.000	220.000	210.000
JUL	190.000	190.000	190.000	190.000
AUG	230.000	220.000	200.000	190.000
SEP	200.000	200.000	200.000	200.000
OCT	200.000	200.000	190.000	190.000
NOV	210.000	200.000	190.000	190.000
DEC	200.000	190.000	190.000	200.000
TITANIUM (UG/L)			**DET'N LIMIT = .050**	**GUIDELINE = N/A**
FEB	16.000	16.000	16.000	17.000
MAR	31.000	29.000	30.000	30.000
APR	19.000	19.000	20.000	20.000
MAY	19.000	19.000	19.000	19.000
JUN	20.000	20.000	20.000	22.000
JUL	24.000	21.000	24.000	23.000
AUG	19.000	18.000	18.000	17.000
SEP	21.000	19.000	21.000	21.000
OCT	13.000	12.000	13.000	14.000
NOV	21.000	19.000	21.000	21.000
DEC	14.000	13.000	13.000	13.000
THALLIUM (UG/L)			**DET'N LIMIT = .010**	**GUIDELINE = 13. (D4)**
FEB	BDL	BDL	.020 <T	.010 <T
MAR	BDL	.020 <T	.010 <T	BDL
APR	BDL	BDL	.020 <T	.020 <T
MAY	BDL	BDL	BDL	BDL
JUN	BDL	BDL	.050 <T	BDL
JUL	BDL	BDL	BDL	BDL
AUG	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
OCT	BDL	BDL	BDL	BDL
NOV	BDL	BDL	.020 <T	BDL
DEC	BDL	BDL	BDL	BDL
URANIUM (UG/L)			**DET'N LIMIT = .020**	**GUIDELINE = 20. (A2)**
FEB	.030 <T	.040 <T	.080 <T	.060 <T
MAR	.070 <T	.040 <T	.060 <T	.040 <T
APR	.040 <T	.030 <T	.090 <T	.040 <T
MAY	.030 <T	.040 <T	.100 <T	.050 <T
JUN	.050 <T	.040 <T	.150 <T	.050 <T
JUL	.050 <T	.040 <T	.080 <T	BDL
AUG	.040 <T	.040 <T	.090 <T	.030 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
SEP	.030 <T	.030 <T	.100 <T	.030 <T	
OCT	.040 <T	.060 <T	.080 <T	.050 <T	
NOV	.100 <T	.070 <T	.080 <T	.080 <T	
DEC	.070 <T	.060 <T	.090 <T	.050 <T	
VANADIUM (UG/L)			DET'N LIMIT = .050		GUIDELINE = 100 (H)
FEB	.150 <T	.050 <T	.020 <T	.010 <T	
MAR	.220 <T	.090 <T	.040 <T	.020 <T	
APR	.170 <T	.040 <T	.020 <T	.010 <T	
MAY	.150 <T	.070 <T	.010 <T	.020 <T	
JUN	.170 <T	.020 <T	.020 <T	.030 <T	
JUL	.230 <T	.090 <T	.090 <T	.090 <T	
AUG	.180 <T	.030 <T	BDL	BDL	
SEP	.190 <T	.020 <T	BDL	BDL	
OCT	.260 <T	.130 <T	.080 <T	.050 <T	
NOV	.210 <T	.080 <T	.060 <T	.070 <T	
DEC	.230 <T	.080 <T	.120 <T	.060 <T	
ZINC (UG/L)			DET'N LIMIT = .001		GUIDELINE = 5000. (A3)
FEB	.380 <T	1.800	340.000	32.000	
MAR	.710 <T	2.000	280.000	34.000	
APR	.640 <T	2.500	310.000	36.000	
MAY	.720 <T	1.900	340.000	30.000	
JUN	.640 <T	3.000	280.000	32.000	
JUL	.600 <T	3.400	130.000	21.000	
AUG	.640 <T	1.300	120.000	24.000	
SEP	.820 <T	1.600	280.000	20.000	
OCT	.540 <T	1.200	220.000	16.000	
NOV	.690 <T	1.200	420.000	25.000	
DEC	.630 <T	1.700	450.000	22.000	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
CHLOROAROMATICS				
HEXACHLOROETHANE (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 1900 (D4)
FEB	BDL	8.000 <T	.	BDL
MAR	BDL	BDL	.	BDL
APR	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
JUN	BDL	BDL	.	BDL
JUL	BDL	BDL	.	BDL
AUG	BDL	BDL	.	BDL
SEP	BDL	BDL	.	BDL
OCT	BDL	BDL	.	BDL
NOV	BDL	BDL	.	BDL
DEC	BDL	BDL	.	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM		
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
PESTICIDES & PCB					
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 700 (G)
FEB	BDL	BDL	.	BDL	
MAR	BDL	BDL	.	BDL	
APR	BDL	BDL	.	BDL	
MAY	BDL	BDL	.	BDL	
JUN	BDL	BDL	.	BDL	
JUL	BDL	BDL	.	BDL	
AUG	BDL	BDL	.	BDL	
SEP	BDL	BDL	.	BDL	
OCT	BDL	BDL	.	BDL	
NOV	BDL	BDL	.	2.000 <T	
DEC	BDL	BDL	.	BDL	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
PHENOLICS (UG/L PHENOLICS)			DET'N LIMIT = 0.2	GUIDELINE = 2.00 (A3)
FEB	BDL	BDL	.	.
MAR	1.200	BDL	.	.
APR	.200 <T	.200 <T	.	.
MAY	BDL	.200 <T	.	.
JUN	BDL	.200 <T	.	.
JUL	.200 <T	.400 <T	.	.
AUG	BDL	BDL	.	.
SEP	1.200	.600 <T	.	.
OCT	.600 <T	.600 <T	.	.
NOV	BDL	BDL	.	.
DEC	1.000	1.000	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM	
	RAW	TREATED	SITE 1	
			STANDING	FREE FLOW
VOLATILES				
BENZENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 5.0 (81)
MAR	BDL	BDL	.	.050 <T
APR	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
JUN	BDL	BDL	.	BDL
JUL	BDL	BDL	.	BDL
AUG	BDL	BDL	.	BDL
SEP	BDL	BDL	.	BDL
OCT	BDL	BDL	.	BDL
NOV	BDL	BDL	.	BDL
DEC	BDL	BDL	.	BDL
TOLUENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 24.0 (84)
MAR	BDL	BDL	.	BDL
APR	BDL	BDL	.	BDL
MAY	BDL	.100 UCS	.	.050 UCS
JUN	.050 <T	.050 <T	.	.100 <T
JUL	BDL	.050 <T	.	.050 <T
AUG	BDL	BDL	.	BDL
SEP	BDL	BDL	.	BDL
OCT	.100 <T	BDL	.	BDL
NOV	BDL	BDL	.	BDL
DEC	BDL	BDL	.	.050 <T
ETHYLBENZENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 2.4 (84)
MAR	.050 <T	BDL	.	.050 <T
APR	.100 <T	.050 <T	.	.100 <T
MAY	BDL	.050 <T	.	BDL
JUN	.100 <T	.050 <T	.	.100 <T
JUL	.050 <T	BDL	.	.050 <T
AUG	.050 <T	.100 <T	.	.050 <T
SEP	.050 <T	.100 <T	.	.050 <T
OCT	.050 <T	.100 <T	.	BDL
NOV	.050 <T	BDL	.	BDL
DEC	BDL	BDL	.	BDL
M-XYLENE (UG/L)			DET'N LIMIT = .100	GUIDELINE = 300 (84)
MAR	BDL	BDL	.	BDL
APR	BDL	BDL	.	BDL
MAY	BDL	BDL	.	BDL
JUN	BDL	BDL	.	.100 <T
JUL	BDL	BDL	.	BDL
AUG	BDL	.200 <T	.	BDL
SEP	.100 <T	BDL	.	.100 <T
OCT	BDL	BDL	.	BDL
NOV	BDL	BDL	.	.100 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1	
			STANDING / FREE FLOW	
DEC	BDL	BDL	. / BDL	
O-XYLENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 300 (B4)
MAR	BDL	BDL	. / BDL	
APR	BDL	BDL	. / BDL	
MAY	BDL	BDL	. / BDL	
JUN	BDL	BDL	. / .050 <T	
JUL	BDL	BDL	. / .050 <T	
AUG	BDL	.100 <T	. / BDL	
SEP	BDL	.050 <T	. / .050 <T	
OCT	BDL	BDL	. / BDL	
NOV	BDL	BDL	. / .200 <T	
DEC	BDL	BDL	. / BDL	
STYRENE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 46.5 (D2)
SEP	.600	BDL	. / .350 <T	
OCT	.450 <T	.450 <T	. / .150 <T	
NOV	.400 <T	BDL	. / BDL	
DEC	.300 <T	BDL	. / BDL	
CHLOROFORM (UG/L)			DET'N LIMIT = .100	GUIDELINE = 350 (A1+)
MAR	BDL	70.200	. / 56.100	
APR	BDL	89.000	. / 44.000	
MAY	BDL	40.000	. / 42.400	
JUN	BDL	82.100	. / 49.900	
JUL	BDL	102.000	. / 45.500	
AUG	BDL	67.000	. / 37.900	
SEP	BDL	71.800	. / 46.600	
OCT	.200 <T	BDL	. / .100 <T	
NOV	BDL	67.000	. / 80.100	
DEC	BDL	61.400	. / 48.200	
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = .050	GUIDELINE = 350 (A1+)
MAR	BDL	17.600	. / 14.950	
APR	BDL	17.850	. / 9.950	
MAY	BDL	12.400	. / 10.900	
JUN	BDL	18.200	. / 14.350	
JUL	BDL	23.450	. / 7.950	
AUG	BDL	19.100	. / 13.300	
SEP	BDL	18.800	. / 10.900	
OCT	BDL	BDL	. / BDL	
NOV	BDL	17.700	. / 18.100	
DEC	BDL	16.000 APS	. / 14.800	
CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = .100	GUIDELINE = 350 (A1+)
MAR	BDL	3.100	. / 2.800	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THAMESVILLE WELL SUPPLY 1988

	WATER TREATMENT PLANT				DISTRIBUTION SYSTEM
	RAW	TREATED	SITE 1		
			STANDING	FREE FLOW	
APR	BDL	3.800	.	2.000	
MAY	BDL	3.000	.	2.000	
JUN	BDL	2.900	.	2.900	
JUL	BDL	3.600	.	2.200	
AUG	BDL	3.700	.	2.700	
SEP	BDL	3.300	.	2.200	
OCT	BDL	BDL	.	BDL	
NOV	BDL	3.400	.	3.200	
DEC	BDL	2.700	.	2.600	
T-CHLOROETHYLENE (UG/L)			DET'N LIMIT = .050		GUIDELINE = 10.0 (C2)
MAR	BDL	BDL	.	BDL	
APR	BDL	BDL	.	BDL	
MAY	BDL	BDL	.	BDL	
JUN	BDL	BDL	.	BDL	
JUL	BDL	BDL	.	BDL	
AUG	BDL	BDL	.	BDL	
SEP	BDL	BDL	.	BDL	
OCT	BDL	BDL	.	BDL	
NOV	BDL	BDL	.	.050 <T	
DEC	BDL	BDL	.	BDL	
TOTL TRIHALOMETHANES (UG/L)			DET'N LIMIT = .500		GUIDELINE = 350 (A1)
MAR	BDL	90.900	.	73.850	
APR	BDL	110.650	.	55.950	
MAY	BDL	55.400	.	55.300	
JUN	BDL	103.200	.	67.150	
JUL	BDL	129.050	.	55.650	
AUG	BDL	89.800	.	53.900	
SEP	BDL	93.900	.	59.700	
OCT	BDL	BDL	.	BDL	
NOV	BDL	88.100	.	101.400	
DEC	BDL	80.100	.	65.600	

Table 6

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
STANDARD PLATE COUNT MEMBRANE FILTRATION	CT/ML	0	500/ML(A1)
P/A BOTTLE		0	0 (A1*)
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100mL(A1)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A
CHLOROAROMATICS			
HEXACHLOROBUTADIENE	NG/L	1.000	450. (D4)
1,2,3-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,3,4-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,3,5-TETRACHLOROBENZENE	NG/L	1.000	10000 (I)
1,2,4-TRICHLOROBENZENE	NG/L	5.000	10000 (I)
1,2,4,5-TETRACHLOROBENZENE	NG/L	1.000	38000 (D4)
1,3,5-TRICHLOROBENZENE	NG/L	5.000	10000 (D4)
HEXACHLOROBENZENE	NG/L	1.0	10. (C1)
HEXACHLOROETHANE	NG/L	1.000	1900. (D4)
OCTACHLOROSTYRENE	NG/L	1.000	N/A
PENTACHLOROBENZENE	NG/L	1.000	74000 (D4)
2,3,6-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,4,5-TRICHLOROTOLUENE	NG/L	5.000	N/A
2,6,A-TRICHLOROTOLUENE	NG/L	5.000	N/A
CHLOROPHENOLS			
2,3,4-TRICHLOROPHENOL	NG/L	50.	N/A
2,3,4,5-TETRACHLOROPHENOL	NG/L	50.	N/A
2,3,5,6-TETRACHLOROPHENOL	NG/L	50.	N/A
2,4,5-TRICHLOROPHENOL	NG/L	50.	2600000 (D4)
2,4,6-TRICHLOROPHENOL	NG/L	50.	5000. (B1)
PENTACHLOROPHENOL	NG/L	50.	60000. (B1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD PH	DMSNLESS	N/A	6.5-8.5(A4)
FIELD TEMPERATURE	°C	N/A	<15 °C(A1)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	.200	30-500(A4)
CALCIUM	MG/L	.100	100. (F2)
CYANIDE	MG/L	.001	.20(A1)
CHLORIDE	MG/L	.200	250. (A3)
COLOUR	TCU	.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.	400. (F2)
FLUORIDE	MG/L	.01	2.4 (A1)
HARDNESS	MG/L	.50	80-100(A4)
MAGNESIUM	MG/L	.05	30. (F2)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
NITRITE	MG/L	.001	1.0 (A1)
TOTAL NITRATES	MG/L	.02	10. (A1)
NITROGEN TOTAL KJELDAHL	MG/L	.02	N/A
PH	DMSNLESS	N/A	6.5-8.5(A4)
PHOSPHORUS FIL REACT	MG/L	.0005	N/A
PHOSPHORUS TOTAL	MG/L	.002	.40(F2)
TOTAL SOLIDS	MG/L	1.	500. (A3)
TURBIDITY	FTU	.02	1.0 (A1)
METALS			
ALUMINUM	UG/L	.050	100. (A4)
ANTIMONY	UG/L	.050	146. (D4)
ARSENIC	UG/L	.050	50. (A1)
BARIUM	UG/L	.020	1000. (A1)
BORON	UG/L	.200	5000. (A1)
BERYLLIUM	UG/L	.010	0.20 (H)
CADMIUM	UG/L	.050	5.0 (A1)
COBALT	UG/L	.020	1000. (H)
CHROMIUM	UG/L	.100	50. (A1)
COPPER	UG/L	.100	1000. (A3)
IRON	UG/L	5.0	300. (A3)
MERCURY	UG/L	.01	1.0 (A1)
MANGANESE	UG/L	.050	50. (A3)
MOLYBDENUM	UG/L	.020	500. (H)
NICKEL	UG/L	.100	50. (F3)
LEAD	UG/L	.020	50. (A1)
SELENIUM	UG/L	.200	10. (A1)
SILVER	UG/L	.020	50. (A1)
STRONTIUM	UG/L	.100	2000. (H)
THALLIUM	UG/L	.010	13. (D4)
TITANIUM	UG/L	.100	N/A
URANIUM	UG/L	.020	20. (A2)
VANADIUM	UG/L	.020	100. (H)
ZINC	UG/L	.020	5000. (A3)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	.2	2.0 (A3)
PESTICIDES & PCB			
ALDRIN	NG/L	1.0	700. (A1)
AMETRINE	NG/L	50.	300000. (D3)
ATRAZINE	NG/L	50.	60000. (B3)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700. (G)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300. (G)
GAMMA HEXACHLOROCYCLOHEXANE(LINDANE)	NG/L	1.0	4000. (A1)
ALPHA CHLORDANE	NG/L	2.0	7000. (A1)
GAMMA CHLORDANE	NG/L	2.0	7000. (A1)
BLADEX	NG/L	100.	10000. (B3)
DIELDRIN	NG/L	2.0	700. (A1)
METHOXYCHLOR	NG/L	5.0	100000. (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000. (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	4.0	74000. (D4)
ENDRIN	NG/L	4.0	200. (A1)
ENDOSULFAN SULPHATE(THIODAN SULPHATE)	NG/L	4.0	N/A
HEPTACHLOR EPOXIDE	NG/L	1.0	3000. (A1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
HEPTACHLOR	NG/L	1.0	3000.	(A1)
METOLACHLOR	NG/L	500.	50000.	(B3)
MIREX	NG/L	5.0	N/A	
OXYCHLORDANE	NG/L	2.0	N/A	
O,P-DDT	NG/L	5.0	30000.	(A1)
PCB	NG/L	20.0	3000.	(A2)
O,P-DDD	NG/L	5.0	N/A	
PPDDE	NG/L	1.0	30000.	(A1)
PPDDT	NG/L	5.0	30000.	(A1)
ATRATONE	NG/L	50.	N/A	
ALACHLOR	NG/L	500.	35000.	(D2)
PROMETONE	NG/L	50.	52500.	(D3)
PROPAZINE	NG/L	50.	16000.	(D2)
PROMETRYNE	NG/L	50.	1000.	(B3)
SENCOR (METRIBUZIN)	NG/L	100.	80000.	(B2)
SIMAZINE	NG/L	50.	10000.	(B3)
POLYAROMATIC HYDROCARBONS				
PHENANTHRENE	NG/L	10.0	N/A	
ANTHRACENE	NG/L	1.0	N/A	
FLUORANTHENE	NG/L	20.0	42000.	(D4)
PYRENE	NG/L	20.0	N/A	
BENZO(A)ANTHRACENE	NG/L	20.0	N/A	
CHRYSENE	NG/L	50.0	N/A	
DIMETHYL BENZO(A)ANTHRACENE	NG/L	5.0	N/A	
BENZO(E)PYRENE	NG/L	50.0	N/A	
BENZO(B)FLUORANTHENE	NG/L	10.0	N/A	
PERYLENE	NG/L	10.0	N/A	
BENZO(K)FLUORANTHENE	NG/L	1.0	N/A	
BENZO(A)PYRENE	NG/L	5.0	10.	(B1)
BENZO(G,H,I)PERYLENE	NG/L	20.0	N/A	
DIBENZO(A,H)ANTHRACENE	NG/L	10.0	N/A	
INDENO(1,2,3-C,D)PYRENE	NG/L	20.0	N/A	
BENZO(B)CHRYSENE	NG/L	2.0	N/A	
CORONENE	NG/L	10.0	N/A	
SPECIFIC PESTICIDES				
TOXAPHENE	NG/L	N/A	5000.	(A1)
2,4,5-TRICHLOROBUTYRIC ACID (2,4,5-T)	NG/L	50.	280000.	(B1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000.	(A1)
2,4-DICHLORORPHENOXYBUTYRIC ACID	NG/L	200.	18000.	(B3)
2,4-D PROPIONIC ACID	NG/L	100.	N/A	
DICAMBA	NG/L	100.	87000.	(B3)
PICHLORAM	NG/L	100.	2450000.	(D3)
SILVEX (2,4,5-TP)	NG/L	50.	10000.	(A1)
DIAZINON	NG/L	20.	14000.	(A1)
DICHLOROVOS	NG/L	20.	N/A	
DURSBAN	NG/L	20.	N/A	
ETHION	NG/L	20.	35000.	(G)
GUTHION	NG/L	N/A	N/A	
MALATHION	NG/L	20.	160000.	(G)
MEVINPHOS	NG/L	20.	N/A	
METHYL PARATHION	NG/L	50.	7000.	(B3)
METHYLTRITHION	NG/L	20.	N/A	
PARATHION	NG/L	20.	35000.	(B1)

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
PHORATE (THIMET)	NG/L	20.	35.	(D2)
RELDAN	NG/L	20.	N/A	
RONNEL	NG/L	20.	N/A	
AMINOCARB	NG/L	N/A	N/A	
BENONYL	NG/L	N/A	N/A	
BUX (METALKAMATE)	NG/L	2000.	N/A	
CARBOFURAN	NG/L	2000.	18000.	(D3)
CICP (CHLORPROPHAM)	NG/L	2000.	350000.	(G)
DIALLATE	NG/L	2000.	30000.	(H)
EPTAM	NG/L	2000.	N/A	
IPC	NG/L	2000.	N/A	
PROPOXUR (BAYGON)	NG/L	2000.	90000.	(G)
SEVIN (CARBARYL)	NG/L	200.	70000.	(A1)
SUTAN (BUTYLATE)	NG/L	2000.	245000.	(D3)
VOLATILES				
BENZENE	UG/L	.050	5.0	(B1)
TOLUENE	UG/L	.050	24.0	(B4)
ETHYLBENZENE	UG/L	.050	2.4	(B4)
PARA-XYLENE	UG/L	.100	300.	(B4)
META-XYLENE	UG/L	.100	300.	(B4)
ORTHO-XYLENE	UG/L	.050	300.	(B4)
1,1-DICHLOROETHYLENE	UG/L	.100	7.0	(D1)
ETHLYENE DIBROMIDE	UG/L	.05	50.	(G)
METHYLENE CHLORIDE	UG/L	.500	1750.	(D3)
TRANS-1,2-DICHLOROETHYLENE	UG/L	.100	350.	(D3)
1,1-DICHLOROETHANE	UG/L	.100	N/A	
CHLOROFORM	UG/L	.100	350.	(A1+)
1,1,1-TRICHLOROETHANE	UG/L	.020	200.	(D1)
1,2-DICHLOROETHANE	UG/L	.050	5.0	(D1)
CARBON TETRACHLORIDE	UG/L	.200	5.0	(D1)
1,2-DICHLOROPROPANE	UG/L	.050	10.0	(G)
TRICHLOROETHYLENE	UG/L	.100	5.0	(D1)
DICHLOROBROMOMETHANE	UG/L	.050	350.	(A1+)
1,1,2-TRICHLOROETHANE	UG/L	.050	.60	(D4)
CHLORODIBROMOMETHANE	UG/L	.100	350.	(A1+)
TETRACHLOROETHYLENE	UG/L	.050	10.0	(C2)
BROMOFORM	UG/L	.200	350.	(A1+)
1,1,2,2-TETRACHLOROETHANE	UG/L	.050	0.17	(D4)
CHLOROBENZENE	UG/L	.100	1510.	(D3)
1,4-DICHLOROBENZENE	UG/L	.100	5.0	(B1)
1,3-DICHLOROBENZENE	UG/L	.100	130.	(G)
1,2-DICHLOROBENZENE	UG/L	.050	200.	(B1)
TRIFLUOROCHLOROTOLUENE	UG/L	.100	N/A	
TOTAL TRIHALOMETHANES	UG/L	.500	350.	(A1)
STYRENE	UG/L	.05	46.5	(D2)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- and an indication of treatment efficiency of plant processes.

Program

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario; currently 44 plants are being monitored. Water supply locations have been prioritized for surveillance, based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit. It is estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analysed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling in order to acquire complete plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of the raw (ambient water) and the treated water at the treatment plant, and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled.

Sampling is carried out by operational personnel who have been trained in the applicable procedures.

Comprehensive standardized procedures and Field Test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". All laboratory analyses are carried out by the MOE Laboratory Services Branch.

Data Reporting Mechanism

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP co-ordinator.

DWSP INPUTS AND OUTPUTS

The DWSP INPUTS and OUTPUTS are illustrated in Fig. 1.

PROGRAM INPUTS

PLANT AND DISTRIBUTION SYSTEM DESCRIPTION

The system description includes plant specific non-analytical information acquired through a questionnaire and initial plant

visit. During the initial assessment of the plant and distribution system the questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The PLANT and DISTRIBUTION SYSTEM DESCRIPTION consists of the following seven components.

1. Process component inventory

All physical and chemical processes that the water is subjected to, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2.Treatment chemicals

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. The chemical dosages applied on the day of sampling are recorded in DWSP.

3. Process control measurements

Documentation of in-plant monitoring of process parameters (turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in

this section. In-plant monitoring results are generally not retained in DWSP but are retained by the Water Treatment Plant.

4. Design flow and retention time

The hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. The maximum, minimum and average flow as well as a record of the flow rate on the day of sampling are recorded in DWSP.

5. Distribution system description

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. Sampling system

Each plant is assessed for its adequacy in terms of sampling of bacteriological, organic and inorganic parameters. The prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant,

preferably a lab area;

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake, discharge and tap), pump characteristics (model, type, capacity) and flow rate.

7. People

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate Ministry of Environment personnel associated with the plant.

FIELD DATA

The second major input to DWSP is field data.

Field data is collected at the plant and from the distribution system sites on the day of sampling. The field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used,

dosages, flow and retention time on the day of sampling as well as monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free,combined and total), temperature and pH. These parameters are analysed according to standardized DWSP protocols to allow for interplant comparison.

LABORATORY ANALYTICAL DATA

The third major input to DWSP is Laboratory Analytical Data.

Samples gathered from the raw, treated and distribution sampling sites are analyzed for approximately 160 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. The parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments parameters may be measured for in a "scan" producing some results for parameters that are not on the DWSP priority list but which may be of interest. The majority of the parameters are measured on a routine basis however, those that are technically more difficult and/or costly to analyse for are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems

may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change notation will e be made and intercomparison data documented.

PARAMETER REFERENCE INFORMATION

The fourth major input to DWSP is Parameter Reference Information

This is a catalogue of information for each substance analysed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database.

An example is shown in fig. 2.

A written copy (hard version) of the Parameter Reference Information will be available in the near future and is a new and sophisticated enhancement to the DWSP.

PROGRAM OUTPUTS

There are four major program outputs, Query, Action Alert, Report Generation and the Annual Report.

QUERY

All DWSP information is easily accessed through the Query function, therefore anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

ACTION ALERTS

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the publication, Ontario Drinking Water Objectives (ISBN 0-7729-2725-1 revised 1983). This publication contains health-related Maximum Acceptable Concentrations for thirty substances. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedences at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, other agency guidelines which are documented in the Parameter Reference Information may be used. If these guidelines are exceeded the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

REPORT GENERATION

Custom reports can be generated from DWSP to meet the needs of the regions and to respond to public requests.

ANNUAL REPORTS

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG. 1

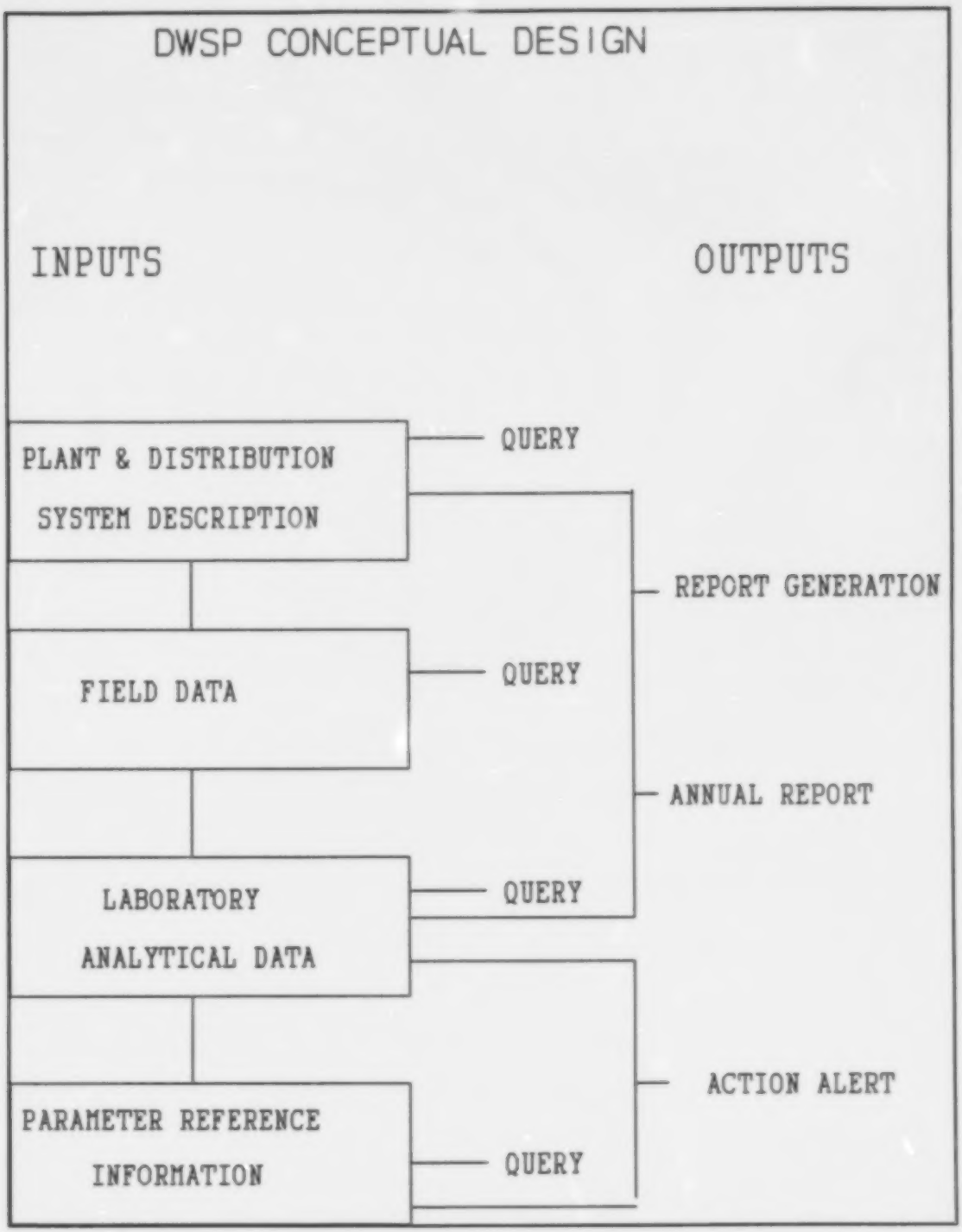
DWSP CONCEPTUAL DESIGN
INPUTS
OUTPUTS
PLANT & DISTRIBUTION SYSTEM DESCRIPTION
FIELD DATA
LABORATORY ANALYTICAL DATA
PARAMETER REFERENCE INFORMATION
QUERY
QUERY
QUERY
QUERY
REPORT GENERATION
ANNUAL REPORT
ACTION ALERT

FIG.2

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

(B2001P) PARAMETER REFERENCE
BENZENE

SOURCE	FROM	TO	METHOD	TARG	UNIT	NOTE
EPA	C 86/04		NOMETH	.00	063000 UG/L	RMCL
EPAA	C 80/11		NOMETH	6.60	063000 UG/L	
FERC	C 84/05		NOMETH	1.00	063000 UG/L	
WHO	C 84/01		NOMETH	10.00	064000 UG/L	

DESCRIPTION: NAME: BENZENE
CAS#: 71432
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 UG/L
SYNONYMS: BENZOLE, COAL NAPHTHA, CARBON OIL (27), CYCLOHEXATRIENE (41)
CHARACTERISTICS: COLOURLESS TO LIGHT YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC, VAPOURS BURN WITH SMOKING FLAME (30)
PROPERTIES:
SOLUBILITY IN WATER: 1780-1800 MG/L AT 25 DEG C (41)
THRESHOLD ODOUR: NO DATA
THRESHOLD TASTE: 0.5 MG/L IN WATER (39)
ENVIRONMENTAL FATE: MAY BIOACCUMUALTE IN LIVING ORGANISMS, APPEARS TO BIOACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT HIGH LIPID CONTENT OR ARE MAJOR METABOLIC SITES (LIVER, BRAIN), SMALL QUANITIES EVAPORATE FROM SOIL OR DEGRADE QUICKLY
SOURCES: PETROLEUM REFINING, SOLVENT RECOVERY, COAL TAR DISTILLATION, FOOD PROCESSING, TANNING.
USES: PREPERATION OF ETHYL BENZENE USED AS A STYRENE MONOMER, DETERGENTS, NYLON, AS INTERMEDIATE IN PESTICIDE PRODUCTION, SOLVENT IN RUBBER INDUSTRY, DEGREASING AND CLEANSING AGENT, GASOLINE.
TOXICITY: RATING 4 (VERY TOXIC); ACUTE - IRRITATES MUCOUS MEMBRANES, SYMPTONS INCLUDE RESTLESSNESS, CONVULSIONS, DEPRESSION, RESPIRATORY FAILURE; CHRONIC - ANEMIA AND LEUKEMIA (45).
CARINOGENICITY: HUMAN CARCINOGEN AND MUTAGEN
REMOVAL: GAC ADSORPTION, PRECIPITATION WITH ALUM FOLLOWED BY SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION (41).
MOLECULAR WEIGHT: 78.12 GRAMS
MELTING POINT: 5.5 DEGREES C (27)
BOILING POINT: 80.1 DEGREES C (27)
SPECIFIC GRAVITY: 0.879 AT 20 DEGREES C (27)
VAPOUR PRESSURE: 100 MM AT 26.1 DEGREES C
HENRY'S LAW CONSTANT: 0.00555 ATM M_3/MOLE
LOG OCT./WATER PAR.COEFF: K=1.0 1/N=1.6 R=.97 PH=5.3

Appendix B

DWSP SAMPLING GUIDELINE

i) RAW and TREATED at PLANT

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (Caution: HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle -tilt bottle when filling -fill bottle completely; there should be no air bubbles.
Organic (OWOC),(OWTRI),(OAPAHX)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle -fill to approx. 1" from top -when 'special pesticides' are requested three extra bottles per sample must be submitted
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle -fill to approx. 1" from top -add 10 drops sodium hydroxide (Caution: NaOH is corrosive)

Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (Caution: HNO_3 and $KCrO_7$ corrosive)
Phenols	-250 mL clear glass bottle -do <u>not</u> rinse bottle -fill to top of label as marked

<u>Steps</u>

1. Let cold water tap run for several minutes.
2. Record time in submission sheet.
3. Record teperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL clear palstic bottle -rinse bottle with sample three times and discard -fill to line
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (Caution: HNO_3 is corrosive)

Steps:

1. Record time on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (**Caution:** HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle; preservative has been added -tilt bottle when filling -fill bottle completely; there should be no air bubbles
Organic (OWOC),(OWTRI)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top -add 10 drops sodium hydroxide (**Caution:** NaOH is corrosive)
Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (**Caution:** HNO_3 and KCrO7 corrosive)

Steps:

1. Record time on submission sheet.
2. Let cold water flow for ten minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total), tubidity and pH on submission sheet.